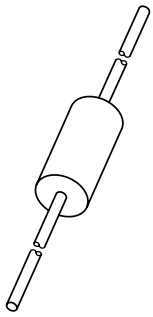
# DATA SHEET



# BY9300 series
## Fast high-voltage soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of 1998 Jul 29

2000 Jan 10

Philips
Semiconductors

PHILIPS

# Fast high-voltage soft-recovery controlled avalanche rectifiers

# BY9300 series

## FEATURES

- Plastic package
- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- 40% overvoltage allowed during 5 seconds
- Guaranteed avalanche energy absorption capability
- Very low reverse recovery time
- Soft-recovery switching characteristics
- Compact construction.

## APPLICATIONS

- For colour television and monitors up to 32 kHz (indication)
- High-voltage applications for:
  - Multipliers
  - Diode-split-transformers (FBTs).

## DESCRIPTION

Plastic package, using glass passivation and a high temperature alloyed construction.

This package is hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.

The package should be used in an insulating medium such as resin, oil or SF6 gas.

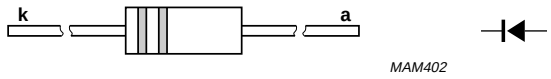



Fig.1 Simplified outline (SOD118A/B) and symbol.

## MARKING

Cathode band colour codes.

| TYPE NUMBER | PACKAGE CODE | OUTER BAND | INNER BAND |
|---|---|---|---|
| BY9304 | SOD118A | white | – |
| BY9306 | SOD118A | white | green |
| BY9308 | SOD118A | white | red |
| BY9310 | SOD118B | white | violet |
| BY9312 | SOD118B | white | orange |
| BY9314 | SOD118B | white | lilac |
| BY9316 | SOD118B | white | grey |
| BY9318 | SOD118B | white | brown |

**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{RRM1}$ | repetitive peak reverse voltage | | | | |
| | BY9304 | | – | 4 | kV |
| | BY9306 | | – | 6 | kV |
| | BY9308 | | – | 8 | kV |
| | BY9310 | | – | 10 | kV |
| | BY9312 | | – | 12 | kV |
| | BY9314 | | – | 14 | kV |
| | BY9316 | | – | 16 | kV |
| | BY9318 | | – | 18 | kV |
| $V_{RRM2}$ | repetitive peak reverse voltage | max. 5 seconds | | | |
| | BY9304 | | – | 5.6 | kV |
| | BY9306 | | – | 8.4 | kV |
| | BY9308 | | – | 11.2 | kV |
| | BY9310 | | – | 14.0 | kV |
| | BY9312 | | – | 16.8 | kV |
| | BY9314 | | – | 19.6 | kV |
| | BY9316 | | – | 22.4 | kV |
| | BY9318 | | – | 25.2 | kV |
| $V_{RSM}$ | non-repetitive peak reverse voltage | | | | |
| | BY9304 | | – | 5.6 | kV |
| | BY9306 | | – | 8.4 | kV |
| | BY9308 | | – | 11.2 | kV |
| | BY9310 | | – | 14.0 | kV |
| | BY9312 | | – | 16.8 | kV |
| | BY9314 | | – | 19.6 | kV |
| | BY9316 | | – | 22.4 | kV |
| | BY9318 | | – | 25.2 | kV |
| $I_{FSM}$ | non-repetitive peak forward current | t = 10 ms half sinewave; $T_j = T_{j\,max}$ prior to surge | – | 0.5 | A |
| $I_{F(AV)}$ | average forward current | averaged over any 20 ms period | | | |
| | BY9304 | | – | 20 | mA |
| | BY9306 | | – | 10 | mA |
| | BY9308 | | – | 5 | mA |
| | BY9310 | | – | 5 | mA |
| | BY9312 | | – | 5 | mA |
| | BY9314 | | – | 5 | mA |
| | BY9316 | | – | 5 | mA |
| | BY9318 | | – | 5 | mA |
| $I_{FRM}$ | repetitive peak forward current | note 1 | – | 500 | mA |

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $T_{stg}$ | storage temperature | | –65 | +175 | °C |
| $T_j$ | junction temperature | | | | |
| | BY9304 | | –65 | +160 | °C |
| | BY9306 | | –65 | +160 | °C |
| | BY9308 | | –65 | +155 | °C |
| | BY9310 | | –65 | +150 | °C |
| | BY9312 | | –65 | +145 | °C |
| | BY9314 | | –65 | +140 | °C |
| | BY9316 | | –65 | +140 | °C |
| | BY9318 | | –65 | +135 | °C |

**Note**

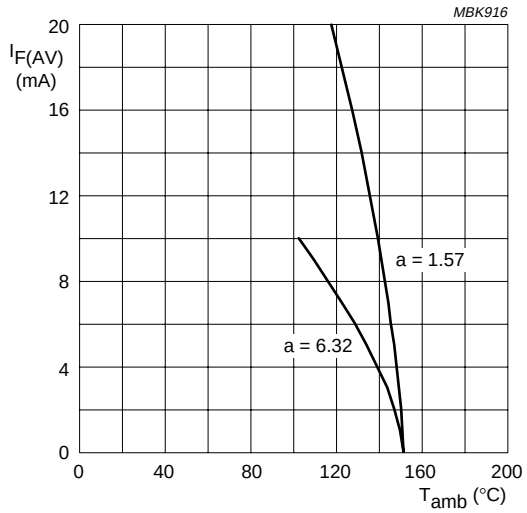
1. Withstands peak currents during flash-over in a picture tube.

**ELECTRICAL CHARACTERISTICS**

$T_j$ = 25 °C; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 10 mA | | | |
| | BY9304 | | – | 10 | V |
| | BY9306 | | – | 14 | V |
| | BY9308 | | – | 20 | V |
| | BY9310 | | – | 24 | V |
| | BY9312 | | – | 30 | V |
| | BY9314 | | – | 34 | V |
| | BY9316 | | – | 40 | V |
| | BY9318 | | – | 44 | V |
| $I_R$ | reverse current | $V_R = V_{RRM1}$ | – | 1 | µA |
| | | $V_R = V_{RRM1}$; $T_j$ = 120 °C | – | 3 | µA |
| $Q_r$ | recovery charge | when switched from $I_F$ = 100 mA to $V_R \geq$ 100 V and $dI_F/dt$ = –200 mA/µs | 0.7 | – | nC |
| $t_{rr}$ | reverse recovery time | when switched from $I_F$ = 2 mA to $I_R$ = 4 mA; measured at $I_R$ = 1 mA | – | 80 | ns |
| $C_d$ | diode capacitance | $V_R$ = 0; f = 1 MHz | | | |
| | BY9304 | | 1.20 | – | pF |
| | BY9306 | | 0.80 | – | pF |
| | BY9308 | | 0.60 | – | pF |
| | BY9310 | | 0.50 | – | pF |
| | BY9312 | | 0.40 | – | pF |
| | BY9314 | | 0.35 | – | pF |
| | BY9316 | | 0.30 | – | pF |
| | BY9318 | | 0.25 | – | pF |

## GRAPHICAL DATA



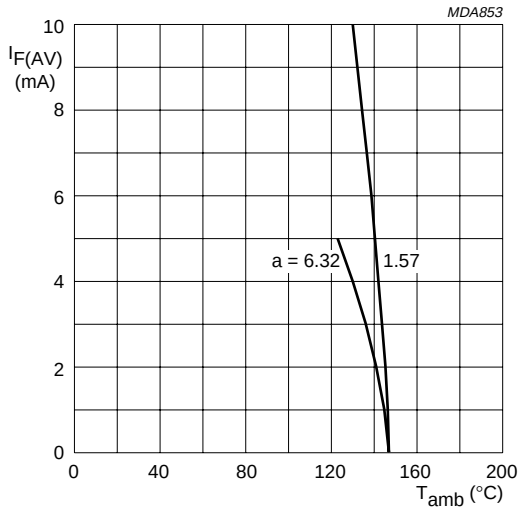

**BY9304**.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application.

Fig.2 Maximum permissible average forward current as a function of ambient temperature.



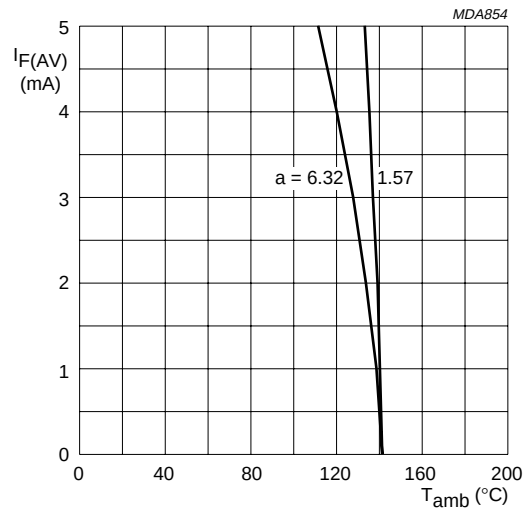

**BY9306**.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application.

Fig.3 Maximum permissible average forward current as a function of ambient temperature.



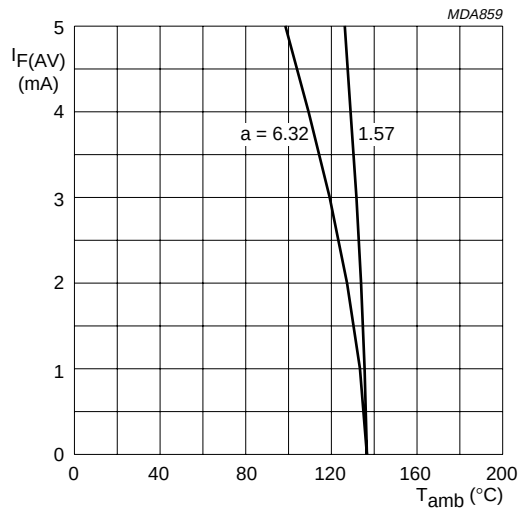

**BY9308**.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

a = 6.32: line output transformer application.

Fig.4 Maximum permissible average forward current as a function of ambient temperature.



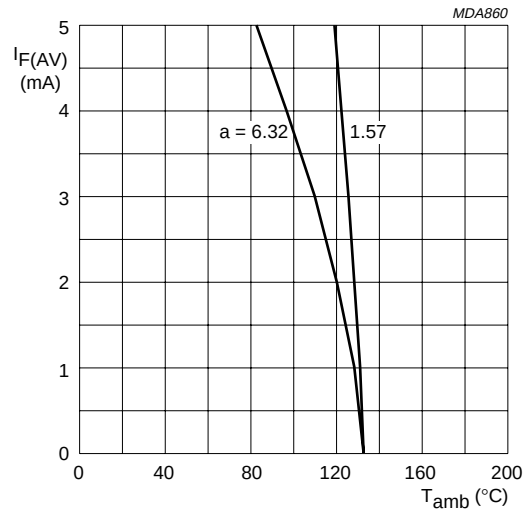

**BY9310**.

a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.

a = 1.57: half sinewave.

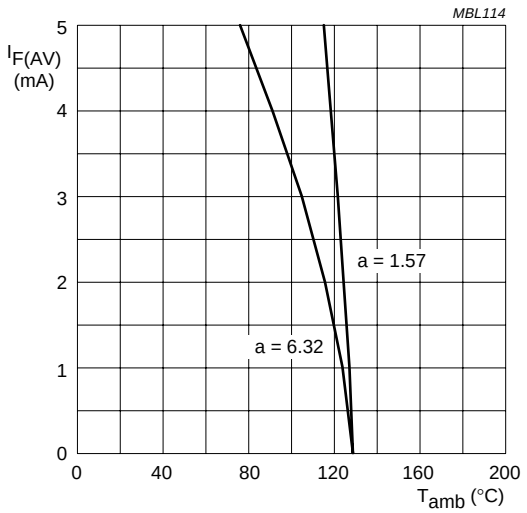
a = 6.32: line output transformer application.

Fig.5 Maximum permissible average forward current as a function of ambient temperature.



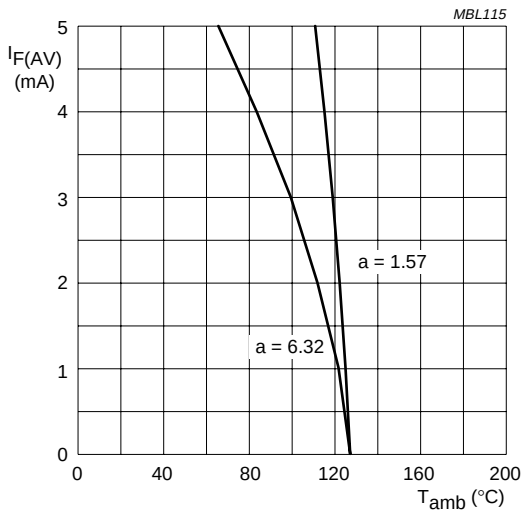

**BY9312**.
a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.
a = 1.57: half sinewave.
a = 6.32: line output transformer application.

Fig.6 Maximum permissible average forward current as a function of ambient temperature.



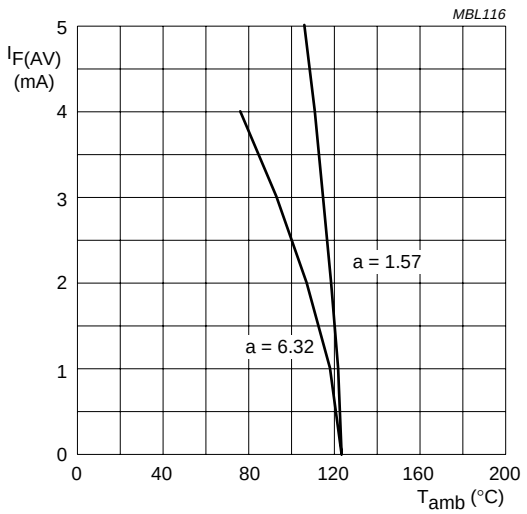

**BY9314**.
a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.
a = 1.57: half sinewave.
a = 6.32: line output transformer application.

Fig.7 Maximum permissible average forward current as a function of ambient temperature.



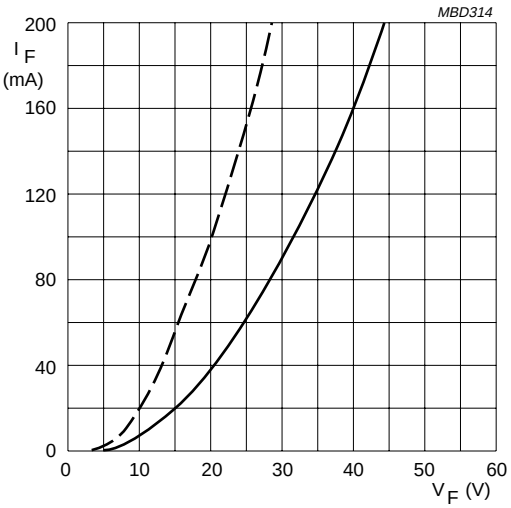

**BY9316**.
a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.
a = 1.57: half sinewave.
a = 6.32: line output transformer application.

Fig.8 Maximum permissible average forward current as a function of ambient temperature.



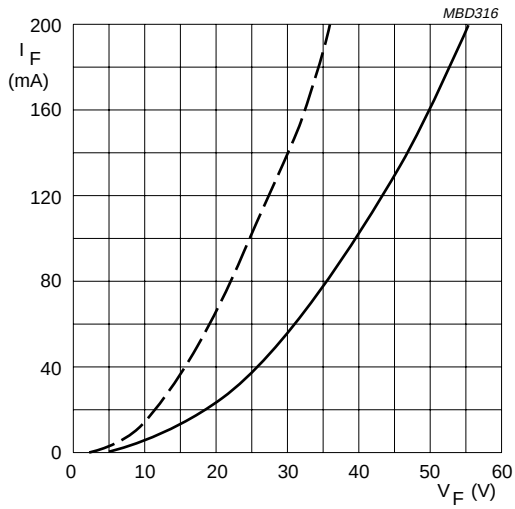

**BY9318**.
a = $I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RWmax}$; $R_{th\ j\text{-}a} \leq 120$ K/W.
a = 1.57: half sinewave.
a = 6.32: line output transformer application.

Fig.9 Maximum permissible average forward current as a function of ambient temperature.



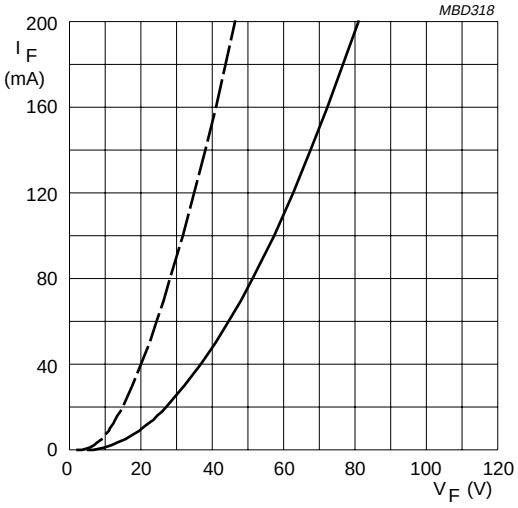

**BY9304**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.10 Forward current as a function of maximum forward voltage.



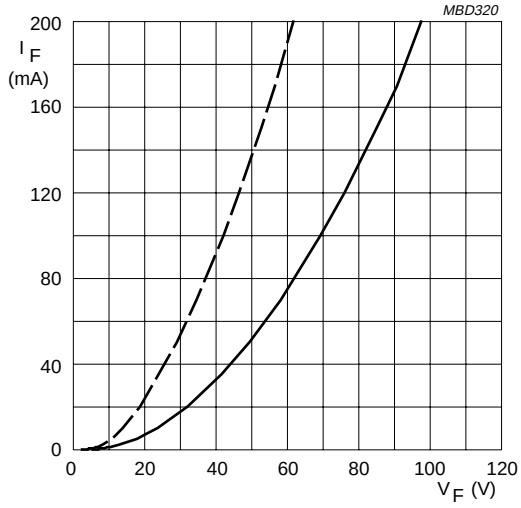

**BY9306**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.11 Forward current as a function of maximum forward voltage.



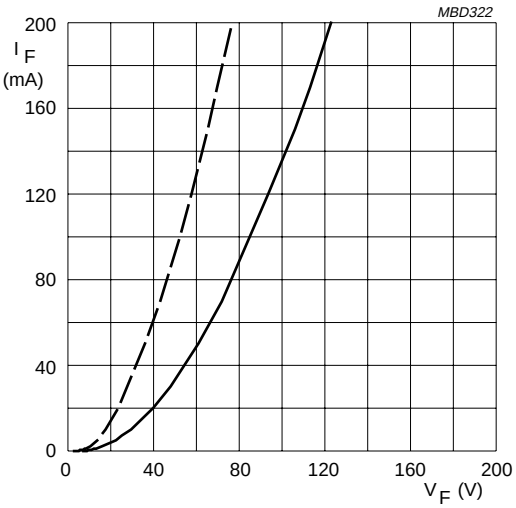

**BY9308**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.12 Forward current as a function of maximum forward voltage.



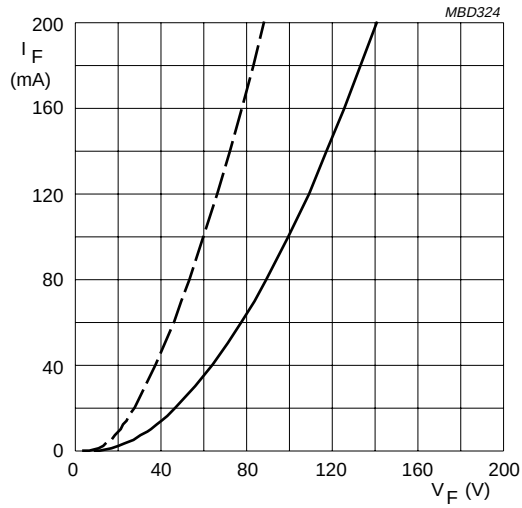

**BY9310**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.13 Forward current as a function of maximum forward voltage.



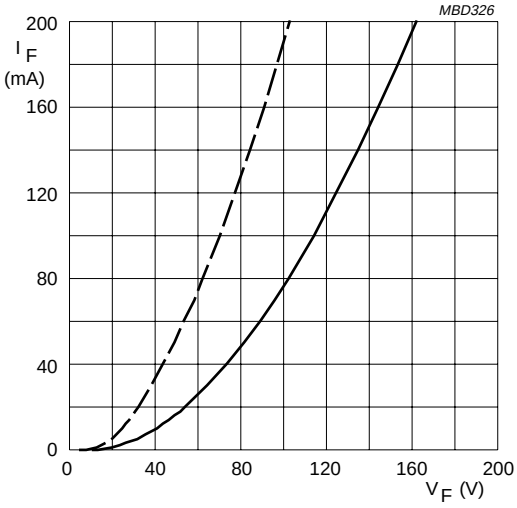

**BY9312**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.14 Forward current as a function of maximum forward voltage.



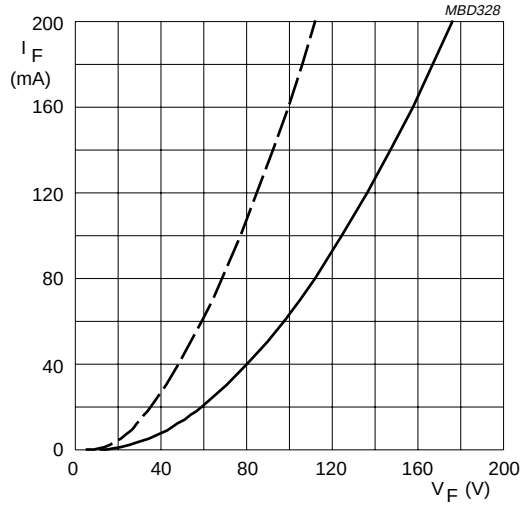

**BY9314**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.15 Forward current as a function of maximum forward voltage.




**BY9316**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.16 Forward current as a function of maximum forward voltage.

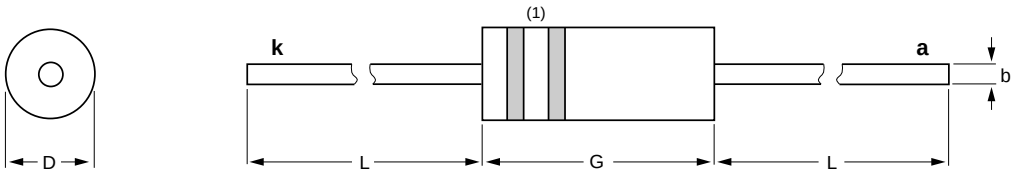



**BY9318**.
Dotted line: $T_j$ = 120 °C.
Solid line: $T_j$ = 25 °C.

Fig.17 Forward current as a function of maximum forward voltage.

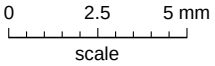
## PACKAGE OUTLINES

**Hermetically sealed plastic package; axial leaded; 2 leads** **SOD118A**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | b | D | G | L min. |
|---|---|---|---|---|
| mm | 0.5 | 2.6<br>2.4 | 6.7<br>6.3 | 31 |

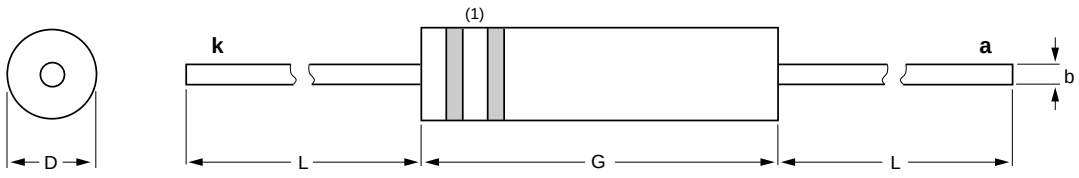



**Note**

1. The marking bands indicate the cathode.

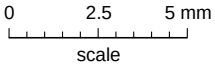
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOD118A | | | | | | 98-05-28 |

**Hermetically sealed plastic package; axial leaded; 2 leads** **SOD118B**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | b | D | G | L min. |
|---|---|---|---|---|
| mm | 0.5 | 2.6<br>2.4 | 10.5<br>9.5 | 29 |




**Note**

1. The marking bands indicate the cathode.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOD118B | | | | | | 98-05-28 |

## DEFINITIONS

| **Data sheet status** | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| **Limiting values** | |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| **Application information** | |
| Where application information is given, it is advisory and does not form part of the specification. | |

## LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

**NOTES**

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